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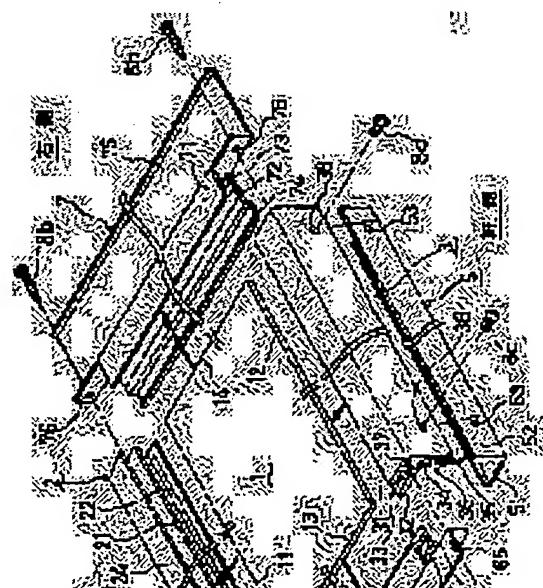
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## **(54) SOLAR BATTERY FRAME STRUCTURE, SOLAR BATTERY ROOF TILE AND MOUNTING METHOD THEREFOR, AND HOT-WATER SUPPLY SYSTEM USING SOLAR ENERGY**

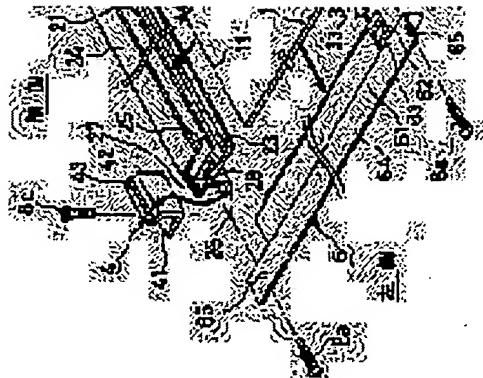
### **(57)Abstract:**

**PROBLEM TO BE SOLVED:** To provide a new solar battery frame structure which further facilitates mounting and dismounting of solar battery roof tiles, and to provide the solar battery roof tiles and a method for mounting the same.

**SOLUTION:** The solar battery frame structure includes a ridge-side transverse frame member 2 mounted on a ridge-side edge 11 of a solar battery cell 1, an eaves-side transverse frame member 3 mounted on an eaves-side edge 12 of the solar battery cell 1, an attaching tool 4 arranged on a roof member, and a connector 5 arranged

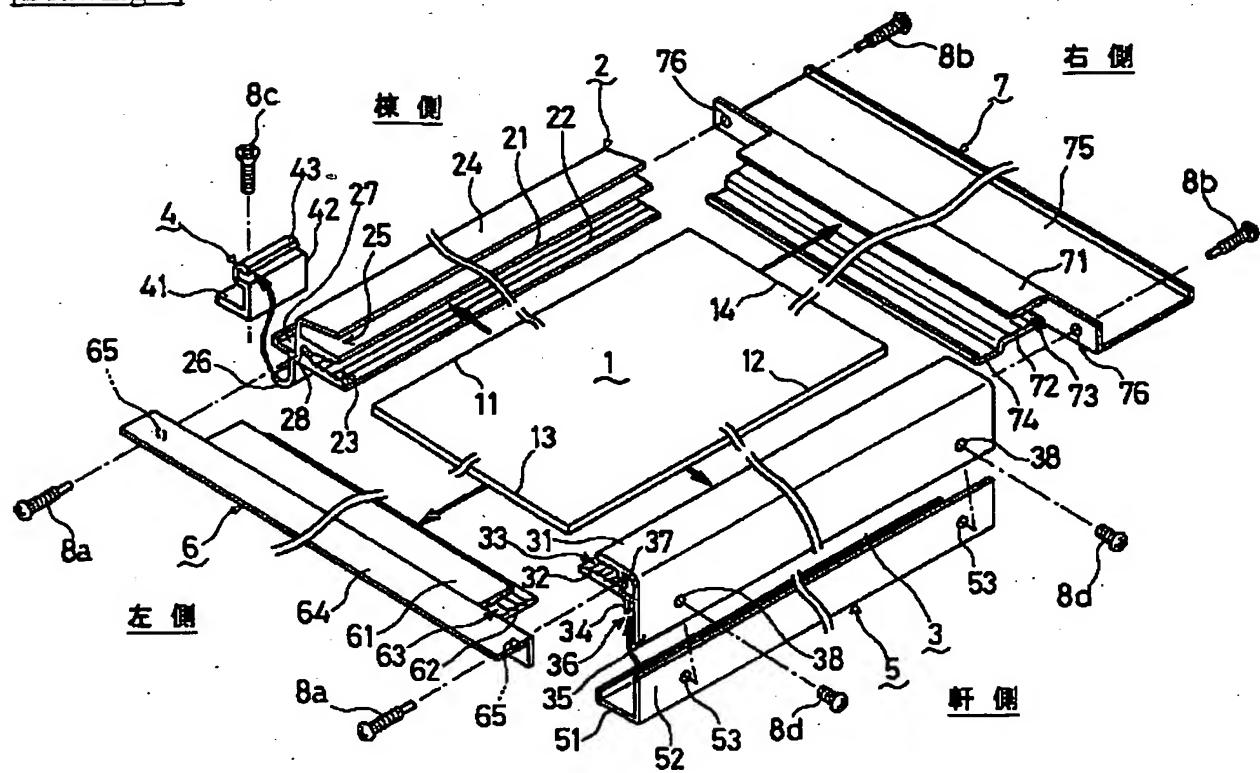


between the eaves-side transverse frame member 3 of the ridge-side solar battery cell 1 which is adjacent to the other cell in an eaves-ridge direction, and the ridge-side transverse frame member 2 of the eaves-side solar battery cell 1. The solar battery frame structure includes an engagement structure which allows the ridge-side transverse frame member 2 to be engageable with the attaching tool 4 in a vertically rotatable manner, and a connection structure which allows the eaves-side transverse frame member 3 and the ridge-side transverse frame member 2 to be connectable together via the attaching tool 5 in a disconnectable manner.

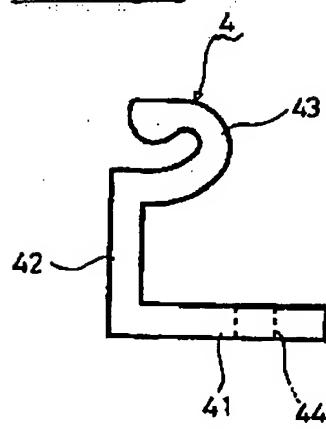


## DRAWINGS

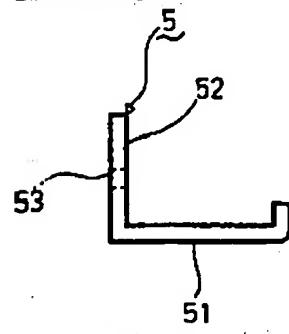
### [Drawing 1]



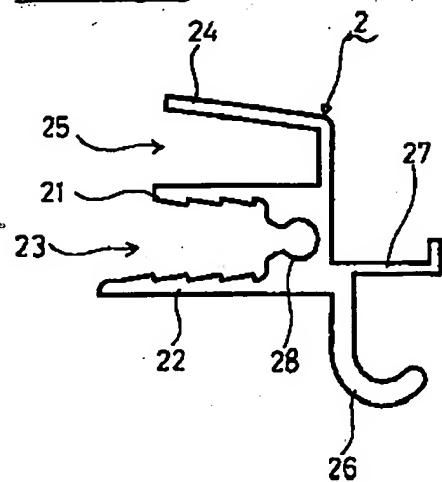
### [Drawing 4]



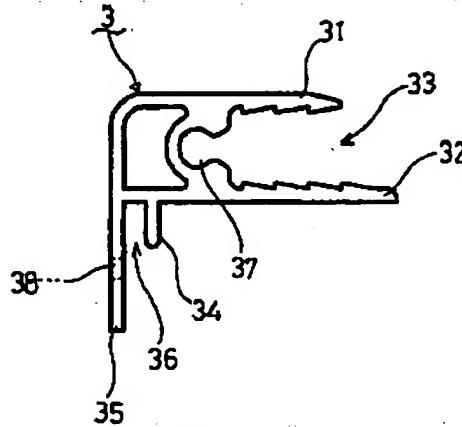
[Drawing 5]



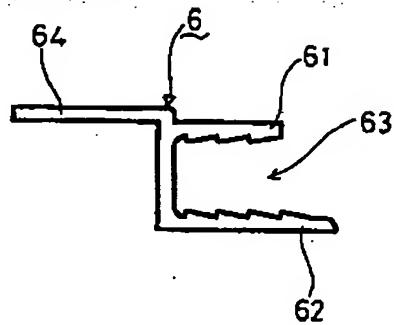
[Drawing 2]



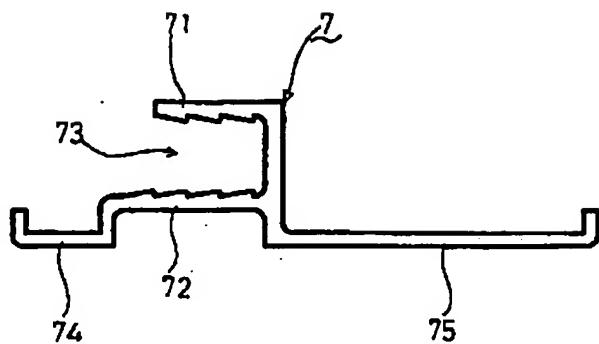
[Drawing 3]



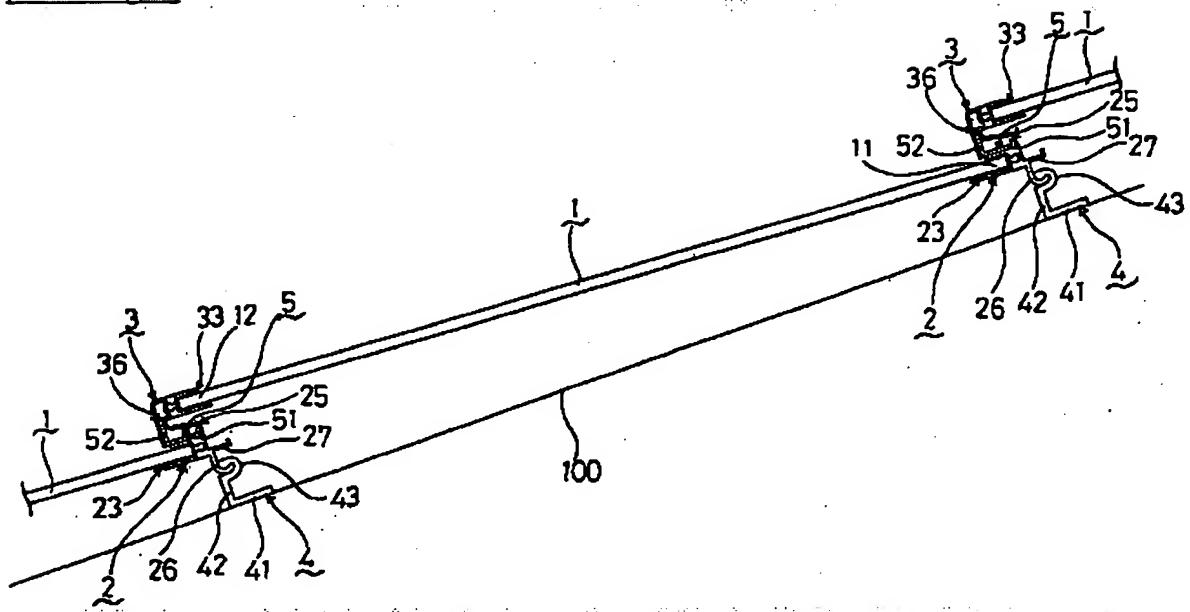
[Drawing 6]



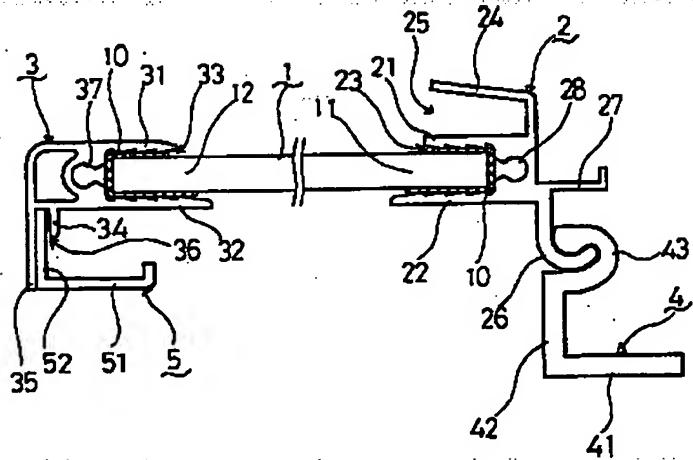
[Drawing 7]



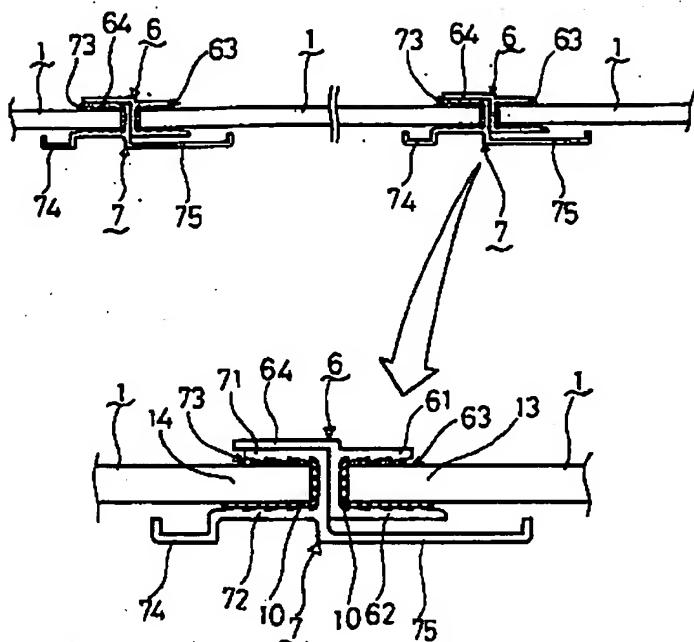
[Drawing 8]



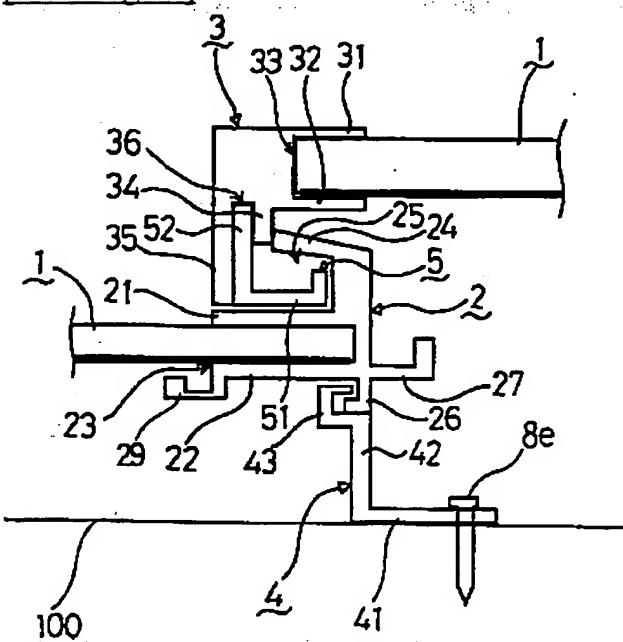
[Drawing 9]



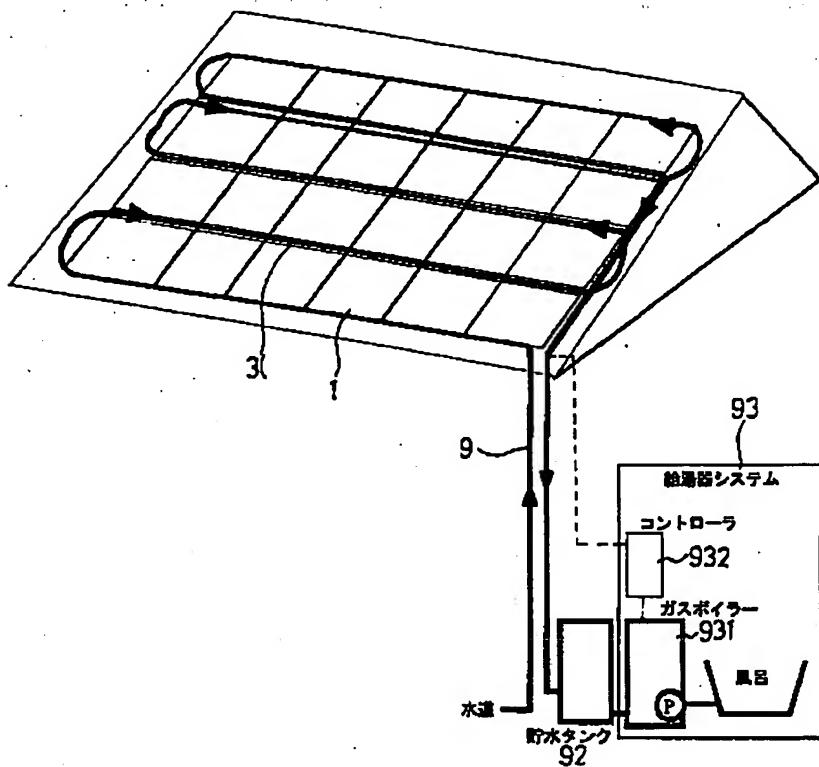
[Drawing 10]



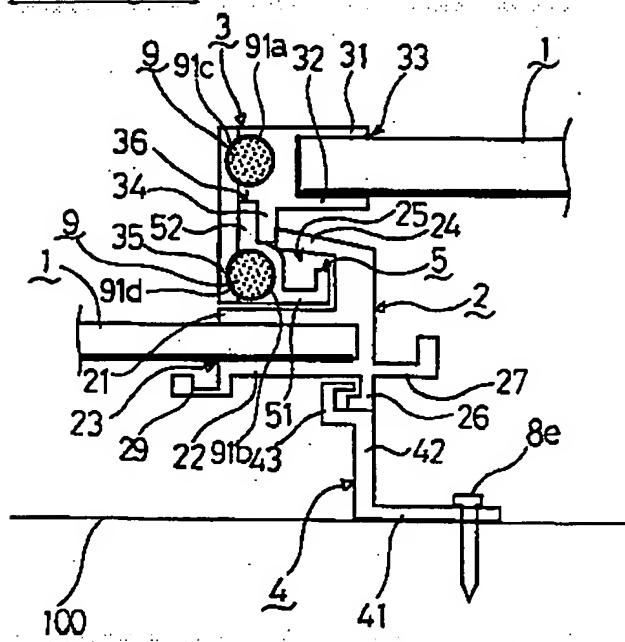
[Drawing 11]



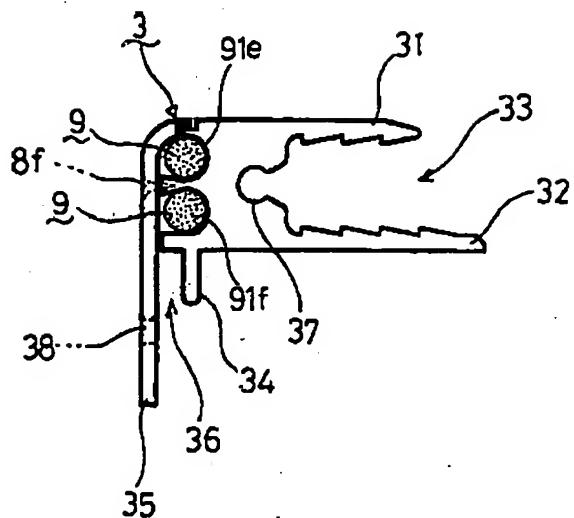
[Drawing 12]



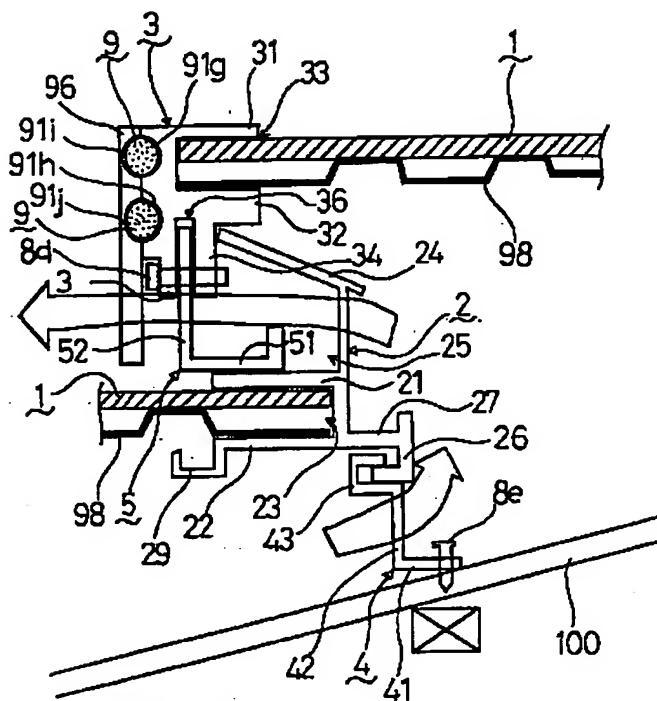
Drawing 13



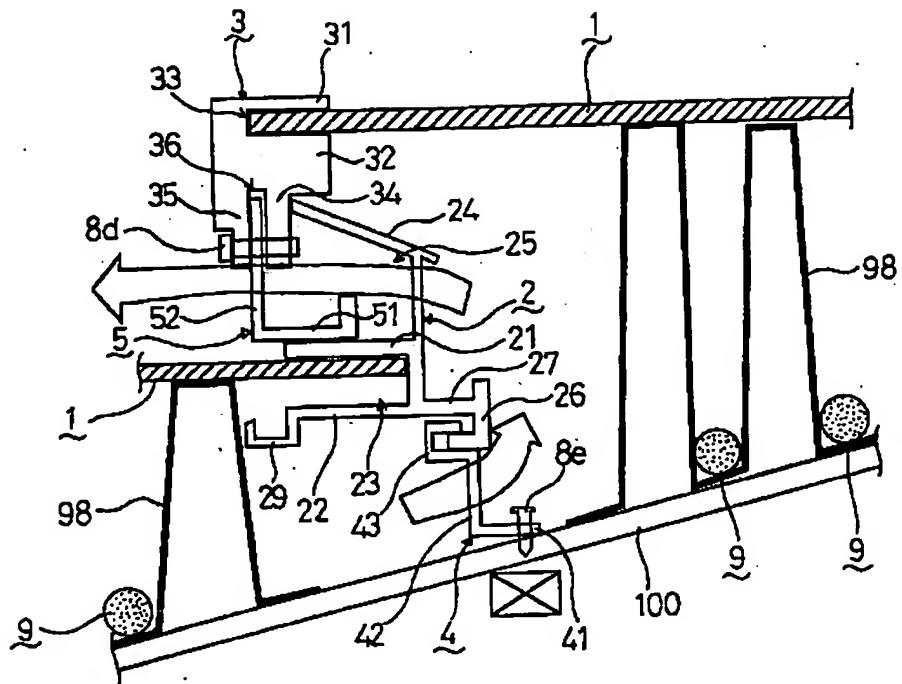
Drawing 14



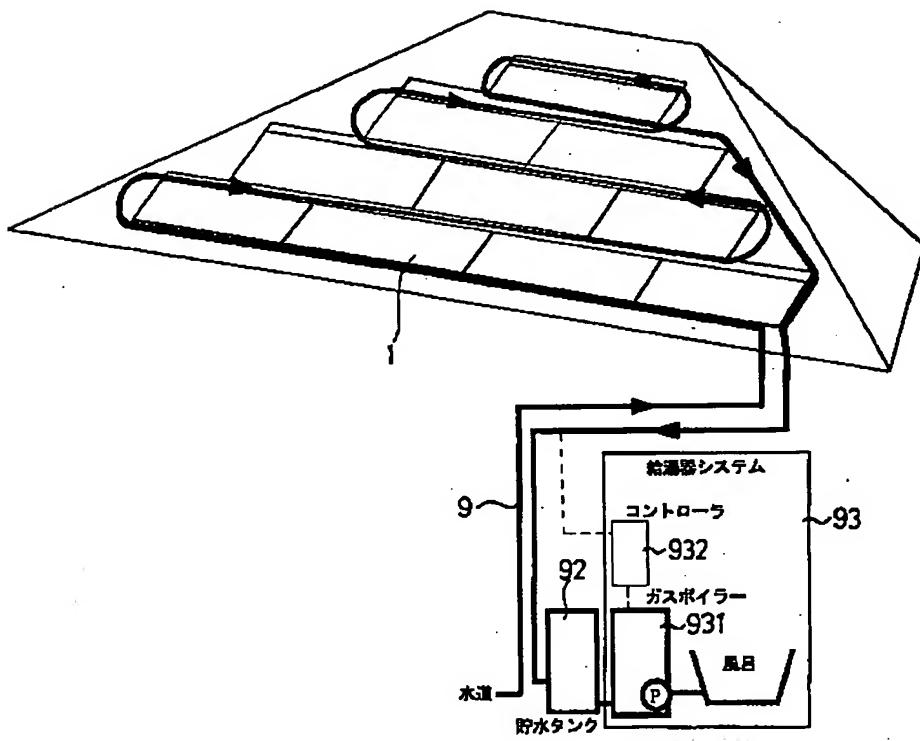
### [Drawing 15]



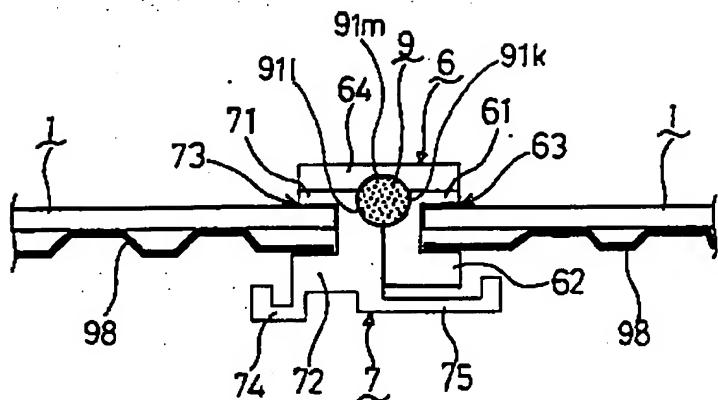
[Drawing 16]



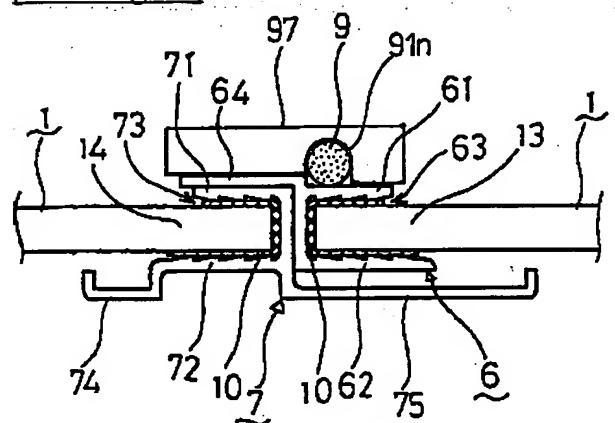
### Drawing 17



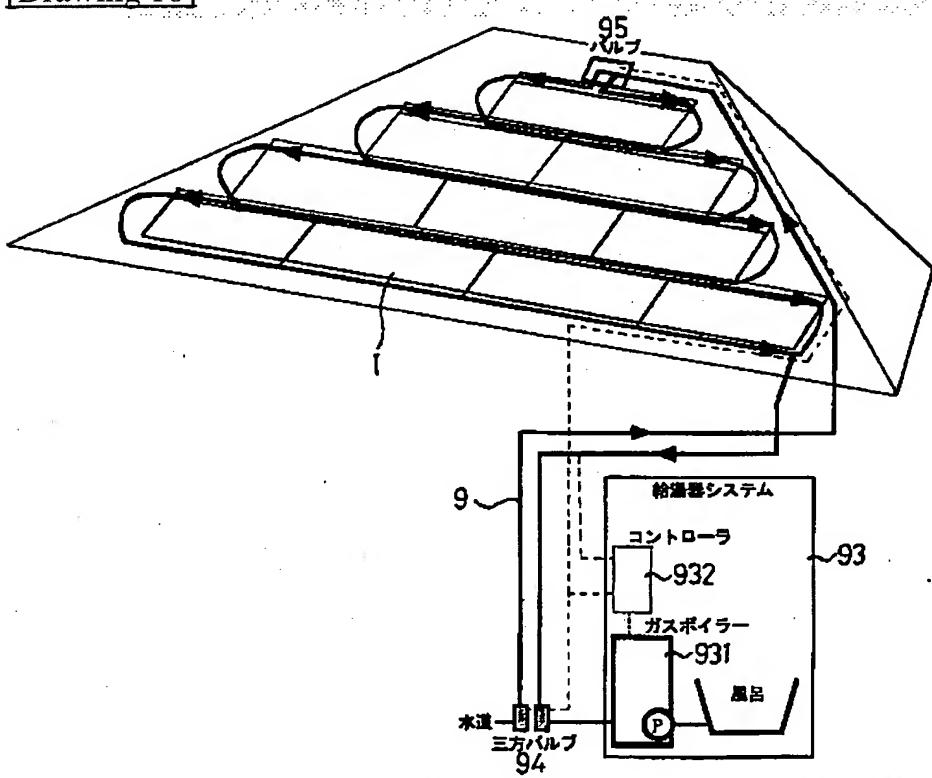
### [Drawing 20]



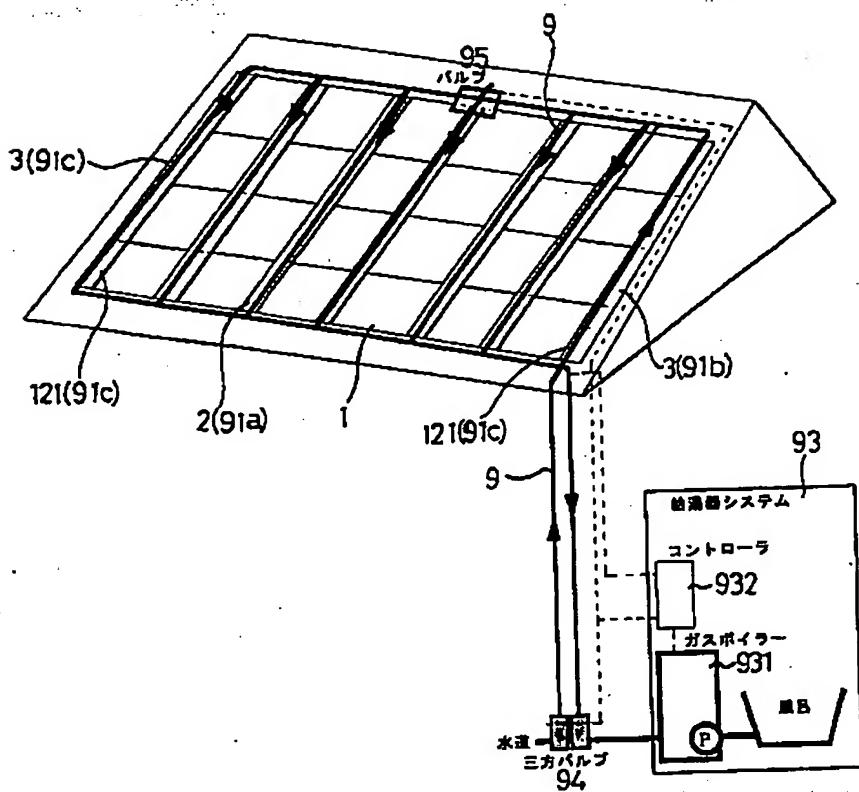
[Drawing 21]



[Drawing 18]



[Drawing 19]



[Translation done.]

## DESCRIPTION OF DRAWINGS

### [Brief Description of the Drawings]

[Drawing 1]It is the exploded perspective view which illustrated one example of the solar battery frame of this invention.

[Drawing 2]It is the important section sectional view which carried out expansion illustration of the ridge side transverse-frame member.

[Drawing 3]It is the important section sectional view which carried out expansion illustration of the eaves side transverse-frame member.

[Drawing 4]It is the important section sectional view which carried out expansion illustration of the fastener.

[Drawing 5]It is the important section sectional view which carried out expansion illustration of the connecting tool.

[Drawing 6]It is the important section sectional view which carried out expansion illustration of the left-hand side longitudinal frame member.

[Drawing 7]It is the important section sectional view which carried out expansion illustration of the right-hand side longitudinal frame member.

[Drawing 8]It is the important section sectional view which illustrated the construction back of the solar cell tile which has solar battery frame.

[Drawing 9]It is the important section sectional view which carried out expansion illustration of the ridge side longitudinal frame member after construction, the eaves side longitudinal frame member, a fastener, and the connecting tool.

[Drawing 10]It is the important section sectional view which carried out expansion illustration of the left-hand side transverse-frame member after construction, and the right-hand side longitudinal frame member.

[Drawing 11]It is the important section sectional view which illustrated one another example of solar battery frame.

[Drawing 12]It is a construct figure showing an example of a solar heat hot water supply system.

[Drawing 13]It is an important section lineblock diagram showing an example of waterway space.

[Drawing 14]It is an important section lineblock diagram showing another example of waterway space.

[Drawing 15]It is an important section lineblock diagram showing another example of waterway space.

[Drawing 16]It is an important section lineblock diagram showing an example in case the waterway body is allocated along with the wavelike portion of a soaking plate.

[Drawing 17]It is a construct figure showing another example of a solar heat hot water supply system.

[Drawing 18]It is a construct figure showing another example of a solar heat hot water supply system.

[Drawing 19]It is a construct figure showing other examples of a solar heat hot water supply system.

[Drawing 20]It is an important section lineblock diagram showing an example of waterway space.

[Drawing 21]It is an important section lineblock diagram showing another example of waterway space.

### [Description of Notations]

1 Photovoltaic cell

- 11 Ridge side edge part
- 12 Eaves side edge part
- 13 Left side end edge
- 14 Right side end edge
- 2 Ridge side transverse-frame member
- 21, 22, and 24 Flat part
- 23 Attachment part
- 25 Connecting part
- 26 Engagement part
- 27 Sluice part
- 28 Screw hole
- 29 Sluice part
- 3 Eaves side transverse-frame member
- 31 and 32 Flat part
- 33 Attachment part
- 34 and 35 Pendent plate part
- 36 Connecting part
- 37 Screw hole
- 38 Screw breakthrough
- 4 Fastener
- 41 Stationary-plate part
- 42 Standing board part
- 43 Engagement part
- 44 Screw breakthrough
- 5 Connecting tool
- 51 Connection flat part
- 52 Connection standing board part
- 53 Screw hole
- 6 Left-hand side longitudinal frame member
- 61 and 62 Flat part
- 63 Attachment part
- 64 Heavy flat part
- 65 Screw breakthrough
- 7 Right-hand side longitudinal frame member
- 71 and 72 Flat part
- 73 Attachment part
- 74, 75 sluice parts
- 76 Screw breakthrough
- 8a-8d fixing screw
- 8e Fixed nail
- 8f fixing screw
- 9 Waterway body
- 91a-91n Waterway space

- 92 Flush tank
- 93 Hot water supply apparatus system
- 931 Gas boiler
- 932 Controller
- 94 Three-way-type valve
- 95 Valve
- 96 Cover body
- 97 Cover body
- 98 Soaking plate
- 10 Waterproof packing
- 100 Roof member

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[Translation done.]

\* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] The invention of this application relates to solar battery frame, a solar cell tile and an execution method for the same, and a solar heat hot water supply system. Attachment / removal construction is easy for the invention of this application in more detail, It is related with the solar heat hot water supply system furnished to the solar cell tile provided with new solar battery frame and its solar battery frame which can perform a maintenance etc. easily, the execution method of the solar battery roof, and a solar battery roof.

#### [0002]

[Description of the Prior Art] With a rise of concern about global environment problems in recent years as one of the new energy art using natural power sources, The solar energy power generation system which transforms sunlight energy into electric power attracting attention, and the utilization being accelerated, and allocating a solar cell tile on roofs, such as a residence, as one of the practical use gestalt of the with a solar cell, is often performed.

[0003] It comes to equip the peripheral edge part (getting it blocked edge part of a ridge side, the eaves side, left-hand side, and right-hand side) of a photovoltaic cell width and a longitudinal frame member as for this solar cell tile, for example.

It is laid on roof claddings, such as roof substrate material, such as sarking and waterproof substrate material, or a plate material.

Suppose that the member in which roof substrate material and a roof cladding and other solar cell tiles may be laid is called a roof member.

#### [0004]

[Problem(s) to be Solved by the Invention] By the way, if it is in the solar cell tile mentioned above, in order to propel utilization of a solar energy power generation system further. The art in which further simplification of attachment / removal construction of a solar cell tile can be attained, and cost reduction of a solar battery roof, a simple maintenance, etc. by improvement in workability can be realized is always longing rare \*\*\*\*. Although various research and development about the structure of the frame member with which a photovoltaic cell is equipped are done conventionally that such art should be realized and the some are used, the actual condition is that what can still satisfy the request from a construction site, etc. is not realized.

[0005] The invention of this application makes it the technical problem to provide the completely new

solar battery frame which is made in view of the situation as above, and can perform more easily attachment / removal construction of a solar cell tile.

[0006]

[Means for Solving the Problem] The ridge side transverse-frame member with which a ridge side edge part and an eaves side edge part of a photovoltaic cell are equipped as that in which an invention of this application solves the above-mentioned technical problem, and the eaves side transverse-frame member, And it has a connecting tool allocated between the eaves side transverse-frame member of a photovoltaic cell by the side of a fastener allocated on a roof member, and a ridge which adjoins an eaves ridge direction, and the ridge side transverse-frame member of a photovoltaic cell by the side of eaves, Engaging structure which can be engaged in a fastener and the ridge side transverse-frame member, and solar battery frame having the joining structure which can be connected enabling free separation via a connecting tool for the eaves side transverse-frame member and the ridge side transverse-frame member, It has a left-hand side longitudinal frame member and a right-hand side longitudinal frame member with which a left side end edge and a right side end edge of a photovoltaic cell are equipped, Solar battery frame a part of one left-hand side longitudinal frame members of a photovoltaic cell and parts of a right-hand side longitudinal frame member of another side which adjoin a longitudinal direction mutually overlapping, and having the waterproof construction which can prevent leakage of water is provided, In such solar battery frames, engaging structure can be engaged free [ vertically and rotationally moving ] in the ridge side transverse-frame member to a fastener, A left-hand side longitudinal frame member and/or a right-hand side longitudinal frame member are equipped [ that the ridge side transverse-frame member is equipped with a sluice part, or ] with a sluice part, In solar battery frame which consists of both further above-mentioned solar battery frames, The sluice parts of a left-hand side longitudinal frame member and/or the sluice parts of a right-hand side longitudinal frame member which are mutually located in an eaves ridge direction which are mutually located in an eaves ridge direction provide as a desirable mode forming a sluice which adjoins and continues etc.

[0007] A solar cell tile, wherein an invention of this application is provided with the above-mentioned solar battery frame is also provided, It is an execution method which lays this solar cell tile on a roof member, Allocate a fastener in a prescribed position on a roof member, and the ridge side transverse-frame member of a solar cell tile by the side of eaves which adjoin an eaves ridge direction is made to engage with this fastener, An execution method of a solar cell tile making the eaves side transverse-frame member of a solar cell tile by the side of a ridge connect with this ridge side transverse-frame member via a connecting tool is also provided.

[0008] Further again that the invention of this application should promote solar thermal conversion with sunlight use in a roof which constructed the above-mentioned solar cell tile, A solar heat hot water supply system, wherein a warm water flow irrigation canal object is allocated on a roof through waterway space with which the eaves side transverse-frame member and/or a fastener were equipped, A solar heat hot water supply system, wherein a warm water flow irrigation canal object is allocated on a roof through waterway space with which a left-hand side longitudinal frame member and/or a right-hand side longitudinal frame member were equipped is provided. In this solar heat hot water supply system, efficiency of heating at the time of a waterway body flow (warm-water-izing) that it should improve more, A soaking plate also provides a mode with which the back side of a photovoltaic cell was equipped, and a mode which formed a soaking plate which has a wavelike portion in the back side of a photovoltaic cell and in which a warm water flow irrigation canal object was made to allocate along with

a wavelike portion of the soaking plate.

[0009]

[Embodiment of the Invention] The solar battery frame of this invention has the ridge side transverse-frame member, the eaves side transverse-frame member, a fastener, and a connecting tool as above-mentioned. The engaging structure which can be engaged in a fastener and the ridge side transverse-frame member, and the eaves side transverse-frame member and the ridge side transverse-frame member (the eaves side transverse-frame member in this case, and the ridge side transverse-frame member) the eaves side transverse-frame member of the photovoltaic cell by the side of the ridge which adjoins an eaves ridge direction mutually [ when laid on a roof member ], and the ridge side transverse-frame member of the photovoltaic cell by the side of eaves -- saying, since it is characterized by having the joining structure which can be connected enabling free separation via a connecting tool. In construction of the solar cell tile provided with such solar battery frame, The ridge side transverse-frame member of the solar cell tile by the side of the eaves which adjoin an eaves ridge direction is made engaged to the fastener allocated in the prescribed position on a roof member, and only making the eaves side transverse-frame member of the solar cell tile by the side of a ridge connect with this ridge side transverse-frame member via a connecting tool -- a solar cell tile -- for example, the ridge direction from eaves or the eaves direction from a ridge -- order -- \*\*\*\*\* -- things are made and attachment to a roof member can be performed very easily.

[0010] Even if it is after attachment construction, it is performing removal construction contrary to the above-mentioned attachment construction order, That is, removing a connecting tool, and making the eaves side transverse-frame member of the solar cell tile by the side of the connected ridge and the ridge side transverse-frame member of the solar cell tile by the side of eaves separate, and canceling engagement to the ridge side transverse-frame member and a fastener can also perform removal easily and arbitrarily in a short time.

[0011] The attachment and removal of a more smooth and easy solar cell tile of the above-mentioned engaging structure are attained with the separable connection by joining structure further again by engagement by engaging structure which can be rotated by the ability of the ridge side transverse-frame member to be engaged free [ vertically and rotationally moving ] to a fastener.

[0012] Thereby, much more simplification of attachment / removal construction of a solar cell tile can be realized, and cost reduction of a solar cell tile and the whole solar battery roof in which this solar cell tile was laid further, a simple maintenance, etc. by improvement in workability are attained.

[0013] On the other hand, other solar battery frames of an invention of this application, It has a left-hand side longitudinal frame member and a right-hand side longitudinal frame member, Since it is characterized by a part of one left-hand side longitudinal frame member of each photovoltaic cell which adjoins a longitudinal direction mutually, and a part of right-hand side longitudinal frame members of another side overlapping, and having the waterproof construction which can prevent leakage of water when laid on a roof member. When the solar cell tile provided with such solar battery frame is constructed on a roof member, it can prevent effectively storm sewage's etc. invading from between the solar cell tiles which adjoined right and left etc., and water leaking to the rear face of a photovoltaic cell thru/or a solar cell tile.

[0014] The photovoltaic cell by such waterproof construction thru/or the rear face of a solar cell tile, and the waterproof effect that prevents the leakage of water to a roof member eventually are assisted, It is [ that the further outstanding waterproof effect should be realized ] preferred both the left-hand side

longitudinal frame member and right-hand side both [ either or ], and that the ridge side transverse-frame member is equipped with the sluice part. Even if storm sewage etc. should have invaded by these sluice parts between each adjoining longitudinal frame member and from between a transverse-frame member and photovoltaic cells etc., it can prevent water leaking in the invasion water to a roof member.

[0015]Of course, the sluice parts of each longitudinal frame member which come to be mutually located in an eaves ridge direction in order to lead invasion water to a front. That is, as for the sluice parts of a left-hand side longitudinal frame member, and/or the sluice parts of a right-hand side longitudinal frame member, it is preferred to form the sluice which adjoins without a crevice mutually and continues in the direction of a front.

[0016]Although the longitudinal frame member of the couple which equips with a photovoltaic cell in between reaches on the other hand here and the side edge part of the photovoltaic cell corresponding to a left-hand side longitudinal frame member and a right-hand side longitudinal frame member, and it for another side is called the left side end edge and the right side end edge. Thus, it could be considered as the left and the right because [ of simplification of explanation ], and the right-and-left position at the time of seeing from the ridge side rather than being limited to the right-and-left position at the time of seeing from the eaves side may be used.

[0017]Although the invention of this application has the feature as above, it shows an example over the drawing attached to below, and describes the embodiment of the invention of this application in more detail.

[0018]

[Example][Example 1] Drawing 1 is the exploded perspective view which illustrated one example of the solar battery frame of this invention.

[0019]In the solar battery frame illustrated to this drawing 1. The ridge side transverse-frame member (2) with which the ridge side edge part (11) and eaves side edge part (12) of a photovoltaic cell (1) are equipped, and the eaves side transverse-frame member (3). And the fastener (4) allocated on a roof member (not shown), And while having a connecting tool (5) allocated between the ridge side transverse-frame members (not shown) with which the ridge side edge part of other photovoltaic cells (not shown) which come to be located in the eaves side transverse-frame member (3) and eaves side of the photovoltaic cell (1) concerned is equipped. It has the left-hand side longitudinal frame member (6) and right-hand side longitudinal frame member (7) with which the left side end edge (13) and right side end edge (14) of a photovoltaic cell (1) are equipped.

[0020]In this case, the ridge side transverse-frame member [ in / first / this example ] (2) if it explains further, For example, the attachment part (23) of the shape of section abbreviation KO type which consists of the flat part (21) and (22) of the couple which counters up and down mutually in which the ridge side edge part (11) of a photovoltaic cell (1) and (referring to drawing 1) are attached as illustrated also to drawing 2, It has a connecting part (25) of the shape of section abbreviation KO type which consists of an upper flat part (21) of the attachment part (23) in which the connection flat part (51) of the connecting tool (5) mentioned later and (referring to drawing 5) are inserted, and its flat part (24) which countered further in the upper position. The opening of these attachment part (23) and the connecting part (25) is mutually carried out to the uniform direction in the vertical position. The flat part (21) and (22) has the sluice part (27) projected to the opposite direction the engagement part (26) which hung from behind [ with the connection of R shape which carries out rotation engagement with the engagement part (43) of the fastener (4) mentioned later ] the attachment part (23), and behind behind

the attachment part (23). These engagement parts (26) and a sluice part (27) are provided along with the longitudinal direction of the ridge side transverse-frame member (2).

[0021] As the eaves side transverse-frame member (3) was illustrated also to drawing 3, the eaves side edge part (12) of a photovoltaic cell (1) and (referring to drawing 1) are attached. The attachment part (33) of the shape of section abbreviation KO type which consists of the flat part (31) and (32) of the couple which counters up and down mutually, It has a connecting part (36) which consists of the pendent plate part (34) and (35) of the couple which hung from the attachment part (33), and which counters mutually in which the connection standing board part (52) of the connecting tool (5) mentioned later and (referring to drawing 5) are inserted.

[0022] The stationary-plate part (41) laid and fixed on a roof member (not shown) as the fastener (4) was illustrated also to drawing 4. It has the engagement part (43) with the connection of R shape by which rotation engagement is carried out with the standing board part (42) set up from the stationary-plate part (41), and the engagement part (26) of the above-mentioned ridge side transverse-frame member (2) provided in the upper bed part of the standing board part (42).

[0023] The connecting tool (5) has the connection standing board part (52) which is inserted in the connection flat part (51) inserted in the connecting part (25) of the above-mentioned ridge side transverse-frame member (2), and the connecting part (36) of the above-mentioned eaves side transverse-frame member (3) and which was set up from the connection flat part (51), as illustrated also to drawing 5.

[0024] On the other hand, as the left-hand side longitudinal frame member (6) was illustrated also to drawing 6, the left side end edge (13) of a photovoltaic cell (1) and (referring to drawing 1) are attached. The attachment part (63) of the shape of section abbreviation KO type which consists of the flat part (61) and (62) of the couple which countered up and down mutually, It has the heavy flat part (64) projected to the opposite direction with the flat part (61) and (62) behind behind the attachment part (63) which laps with the upper flat part (71) of the attachment part (73) of a right-hand side longitudinal frame member (7), and (refer to drawing 7) so that it may mention later.

[0025] As the right-hand side longitudinal frame member (7) was illustrated also to drawing 7, the right side end edge (14) of a photovoltaic cell (1) and (referring to drawing 1) are attached. The attachment part (73) of the shape of section abbreviation KO type which consists of the flat part (71) and (72) of the couple which countered up and down mutually, The flat part (71) and (72) has the sluice part (75) projected to the opposite direction the sluice part (74) installed from the projecting end edge of the flat part (72) of the lower part of an attachment part (73), and behind behind the attachment part (73). These sluice part (74) and (75) is formed along with the longitudinal direction of a right-hand side longitudinal frame member (7).

[0026] The solar battery frame of such this example 1 constitutes a solar cell tile as follows, and lays this solar cell tile on a roof member. First, the ridge side transverse-frame member (2) in the above-mentioned solar battery frame, the eaves side transverse-frame member (3), a left-hand side longitudinal frame member (6), and the attachment part (23) of each right-hand side longitudinal frame member (7). The ridge side edge part (11), the eaves side edge part (12), left side end edge (13), and right side end edge (14) of a photovoltaic cell (1) are attached in an attachment part (33), an attachment part (63), and an attachment part (73). more specifically, the ridge side edge part (11) of a photovoltaic cell (1) is inserted in between the flat part (21) and flat part (22) which constitute the attachment part (23) of the

ridge side transverse-frame member (2), for example -- it is pinched by the flat part (21) and (22), and is attached in an attachment part (23). [ both ] The same may be said of other edge parts of a photovoltaic cell (1).

[0027]And a left-hand side longitudinal frame member (6), the ridge side transverse-frame member (2), and the eaves side transverse-frame member (3), For example, as illustrated to drawing 1, a fixing screw (8a) is thrust into the screw hole (28) and screw hole (37) which were established in the left side end of the ridge side transverse-frame member (2) and the eaves side transverse-frame member (3) through the screw breakthrough (65) provided in the left-hand side longitudinal frame member (6), It is fixed mutually and similarly a right-hand side longitudinal frame member (7), the ridge side transverse-frame member (2), and the eaves side transverse-frame member (3), A fixing screw (8b) is thrust into the screw hole (28) and screw hole (37) which were established in the right side end of the ridge side transverse-frame member (2) and the eaves side transverse-frame member (3) through the screw breakthrough (76) provided in the right-hand side longitudinal frame member (7), and is fixed mutually. Thus, the peripheral edge part of a photovoltaic cell (1) is equipped with each frame member (2), (3), (6), and (7), and a solar cell tile is constituted.

[0028]Then, in the case where this solar cell tile is laid on a roof member, as illustrated, for example to drawing 8, a fastener (4) is first allocated in the prescribed position on a roof member (100). This lays a stationary-plate part (41) on a roof member (100), and performs it by the screw stop by the fixing screw (8c) (refer to drawing 1) which passes along the screw breakthrough (44) provided in the stationary-plate part (41), and (refer to drawing 4), or the nail stop according to a fixed nail (8e) as illustrated to below-mentioned drawing 11.

[0029]This fastener (4) may be fixed making the engagement part (26) of the ridge side transverse-frame member (2) engage with that engagement part (43) so that it may mention later one by one, even if it fixes to the position displayed by carrying out marking beforehand for example. Although one short length fastener (4) is accepted and illustrated to the ridge side transverse-frame member (2) in drawing 1, Of course, neither the number nor the linear dimension to the ridge side transverse-frame member (2) is what is limited. Since what is necessary is just to be able to support the ridge side transverse-frame member (2) in the roof member upper part, a mode -- two or more short length fasteners (4) are used, for example, or the fastener (4) of one long picture is used -- is also possible.

[0030]Subsequently, rotation engagement of the engagement part (26) of the ridge side transverse-frame member (2) of the solar cell tile for construction is carried out to the engagement part (43) of a fastener (4). This carries out alignment of the engagement part (26) of the ridge side transverse-frame member (2), and the engagement part (43) of a fastener (4), hooks them, and performs them by taking down caudad a solar cell tile thru/or the photovoltaic cell (1) itself from a slanting upper position centering on an engagement part (26) and an engagement part (43). Thus, it turns out that engaging structure which can be engaged free [ vertically and rotationally moving ] is realized for the ridge side transverse-frame member (2) to a fastener (4) by the engagement part (26) of the ridge side transverse-frame member (2), and the engagement part (43) of a fastener (4).

[0031]And if the solar cell tile itself is caudad taken down from the upper part at the time of the rotation engagement to the engagement part (26) of the ridge side transverse-frame member (2), and the engagement part (43) of a fastener (4), The eaves side transverse-frame member (3) in the opposite hand of the ridge side transverse-frame member (2) comes to be located above the ridge side transverse-frame

member (2) of other solar cell tiles by the side of the eaves already laid located in the eaves side of the solar cell tile concerned in the middle of construction. This eaves side transverse-frame member (3) and the ridge side transverse-frame member (2) are made to connect via a connecting tool (5) here. First, this makes the connection flat part (51) insert in the connecting part (25) of the ridge side transverse-frame member (2), attaches a connecting tool (5) to a connecting part (25), and, subsequently takes down the eaves side transverse-frame member (3), It carries out by making the connection standing board part (52) of a connecting tool (5) insert in the connecting part (36) which carried out the opening caudad. In this way, It turns out that joining structure which can be connected enabling free separation is realized for the eaves side transverse-frame member (3) and the ridge side transverse-frame member (2) via a connecting tool (5) by the connecting part (36) of the eaves side transverse-frame member (3), the connecting part (25) of the ridge side transverse-frame member (2), and the connecting tool (5).

[0032]A connecting tool (5) and the eaves side transverse-frame member (3), For example, it may be made to fix with screws mutually by thrusting into the screw hole (53) established in the connecting tool (5) through the screw breakthrough (38) in which the fixing screw (8d) was formed by the eaves side transverse-frame member (3) as illustrated to drawing 1. Although the solar cell tile laid on the roof member (100) usually inclines according to the inclination of a roof, Since R shape of the engagement part (43) of a fastener (4) geared with R shape of the engagement part (26) of the ridge side transverse-frame member (2) firmly and is caught mutually, a solar cell tile shifts to an eaves direction, or does not separate.

[0033]Rotation engagement of the ridge side transverse-frame member (2) is carried out to a fastener (4) as mentioned above, and only making the eaves side transverse-frame member (3) connect with the ridge side transverse-frame member (2) of other solar cell tiles which adjoined the eaves side via a connecting tool (5) -- dramatically -- easy -- a solar cell tile -- the ridge direction from eaves, or the eaves direction from a ridge -- order -- \*\*\*\*\* -- things are made.

[0034]Of course, since the ridge side transverse-frame member (2) can be freely rotated to a fastener (4) as mentioned above, and the eaves side transverse-frame member (3) can be freely separated to the ridge side transverse-frame member (2), Remove a connecting tool (5) and the connected eaves side transverse-frame member (3) and the ridge side transverse-frame member (2) are made to separate, And removal of a solar cell tile can also be easily performed in a short time only by rotating the ridge side transverse-frame member (2) to a fastener (4), as the separated eaves side transverse-frame member (3) is raised up the whole solar cell tile, and canceling engagement to a fastener (4). What is necessary is just to remove a fixing screw (8d), when the screw stop of the connecting tool (5) is carried out to the eaves side transverse-frame member (3), as mentioned above.

[0035]In this example 1, the attachment part (23) of the ridge side transverse-frame member (2), The attachment part (33) of the eaves side transverse-frame member (3), the attachment part (63) of a left-hand side longitudinal frame member (6), And the portion to which the attachment part (73) of a right-hand side longitudinal frame member (7) touches the upper surface and the undersurface of the ridge side edge part (11) of the photovoltaic cell (1) attached in it by each, an eaves side edge part (12), a left side end edge (13), and a right side end edge (14) serves as corrugated form. the medial surface which more specifically counters mutually [ of the flat part (21) which constitutes the attachment part (23) of the ridge side transverse-frame member (2), for example, and each flat part (22) ] has corrugated form. Other eaves side transverse-frame members (3), left-hand side longitudinal frame members (6), and right-hand side longitudinal frame members (7) are the same. By establishing such corrugated form,

attachment of the ridge side edge part (11) of a photovoltaic cell (1), an eaves side edge part (12), a left side end edge (13), and a right side end edge (14) will become firmer, and generating of gap of a photovoltaic cell (1) etc. can be controlled.

[0036]As mentioned above, now, the ridge side transverse-frame member (2) eaves side transverse-frame member (3), If it is in the solar cell tile laid on the roof member (100) via the fastener (4) and the connecting tool (5), the waterproof effect is further realized as follows by the left-hand side longitudinal frame member (6) and right-hand side longitudinal frame member (7) of the right and left.

[0037]Namely, as illustrated, for example to drawing 10, the heavy flat part (64) of one left-hand side longitudinal frame member (6) of each solar cell tile which adjoined right and left comes to pile up the attachment part (73) of a right-hand side longitudinal frame member (7) mutually on the constituted upper flat part (71), and it by this. The leakage of water from between a left-hand side longitudinal frame member (6) and right-hand side longitudinal frame members (7) can be prevented effectively.

[0038]Even if storm sewage etc. should have been transmitted to the crevice and should have invaded, the invasion water from between a left-hand side longitudinal frame member (6) and right-hand side longitudinal frame members (7) leaks to a roof member by the sluice part (75) of a right-hand side longitudinal frame member (7). Since the sluice part (75) of a right-hand side longitudinal frame member (7) is further located down the left side end edge (13) of the photovoltaic cell (1) currently attached in the attachment part (63) of a left-hand side longitudinal frame member (6), and it, He is trying not to leak the invasion water from between the attachment part (63) of a left-hand side longitudinal frame member (6), and the left side end edges (13) of a photovoltaic cell (1) to a roof member, either. The sluice part (74) of another side of a right-hand side longitudinal frame member (7) is kept from leaking the invasion water from between the right side end edges (14) of the photovoltaic cell (1) currently attached in the attachment part (73) of a right-hand side longitudinal frame member (7), and it to a roof member.

[0039]And the sluice parts (74) of each right-hand side longitudinal frame member (7) and sluice parts (75) which were mutually located in the eaves ridge direction adjoin without a crevice, and it can lead to a front by forming the sluice which continues from a ridge to a front, without leaking the invasion water from various courses to a roof member.

[0040]Although the right-hand side longitudinal frame member (7) is equipped with the sluice part (74) and (75) in this example 1, A left-hand side longitudinal frame member (6) can be equipped with such [, of course ] a sluice part, and about the shape, position, etc., if it can lead in the direction of a front, without leaking invasion water to a roof member, it is easy to be. Although leak-prevention by overlap is realized by the heavy flat part (64) of the left-hand side longitudinal frame member (6), This heavy flat part (64) and the same heavy flat part may be provided in the right-hand side longitudinal frame member (7) so that it may lap on the flat part (61) of a left-hand side frame member (6).

[0041]In this example 1, further, so that the ridge side transverse-frame member (2) may be equipped with the sluice part (27) and the physical relationship illustrated to drawing 8 may also show, He blocks the invasion water from between the attachment parts (33) of the eaves side transverse-frame member (3) and the eaves side edge parts (12) of a photovoltaic cell (1) which were located in that upper part after construction by this sluice part (27) etc., and is trying not to be dropped at a roof member (100).

[0042]In order to heighten a waterproof effect further, as illustrated, for example to drawing 9 and drawing 10, The attachment part (33) of the attachment part of ridge side transverse-frame member (2) (23) eaves side transverse-frame member (3), In the attachment part (63) of a left-hand side longitudinal

frame member (6), and the attachment part (73) of a right side frame member (7). It may have waterproof packing (10) so that the crevice between the ridge side edge part (11) of they and a photovoltaic cell (1), an eaves side edge part (12), a left side end edge (13), and a right side end edge (14) may be abolished as much as possible and generating of leakage of water may be prevented.

[0043][Example 2] Drawing 11 is an important section sectional view showing one another example of the solar battery frame of this invention. In the example shown in this drawing 11, the engaging structure which consists of an engagement part (26) of the ridge side transverse-frame member (2) and an engagement part (43) of a fastener (4), It differs from the rotation engaging structure in the above-mentioned Example 1, and engagement to the ridge side transverse-frame member (2) and a fastener (4) is realized by the hook engagement to the engagement part (26) which carried out the opening to the eaves direction, and the engagement part (43) which carried out the opening to the ridge direction. It cannot be overemphasized that construction of a smooth solar cell tile is possible also by this engaging structure.

[0044]In this example 2, it has the sluice part (29) installed in the flat part (22) of the lower part of an attachment part (23) from the projecting end in the ridge side transverse-frame member (2). The leakage of water to the roof member (100) of the invasion water from between an attachment part (23) and the ridge side edge parts (11) of the photovoltaic cell (1) attached in it is prevented by this sluice part (29).

[0045]The stationary-plate part (41) of the fastener (4) is being fixed to the roof member (100) by the fixed nail (8e).

The solar heat hot water supply system (or solar-heat hot water system) which exploitation of solar energy is not restricted to the solar energy power generation system which makes the electrical and electric equipment by sunlight, and makes warm water from [Example 3] and time with solar heat also exists. In the same roof, if both a solar energy power generation system and a solar heat hot water supply system can be furnished, still more efficient exploitation of solar energy can be promoted.

[0046]So, in this invention, the solar heat hot water supply system furnished to the same roof with the solar energy power generation system by an above-mentioned solar cell tile is provided. Drawing 12 is a key map showing an example of this solar heat hot water supply system. In the example of this drawing 12, the solar cell tile (the numerals (1) of a photovoltaic cell are indicated in a figure) was allocated, and between the solar cell tiles which adjoin an eaves ridge direction, the waterway body (9) through which warm water flows, and the (warm water flow irrigation canal object) ran, and it has surrounded. More specifically, this waterway body (9) can be allocated on a roof like each following example through each waterway space established in the frame member of the solar cell tile, etc., for example.

[0047]The waterway space (91a) for waterway bodies (9) (91b) is established in the <example of drawing 13> eaves side transverse-frame member (3), and the fastener (4). In the eaves side transverse-frame member (3), the pendent plate part (35) which constitutes a connecting part (36) serves as a removable segregant, and the waterway space (91c) (91d) corresponding to waterway space (91a) (91b) is established in the pendent plate part (35) used as this segregant. A pendent plate part (35) is attached and the perfect waterway space which followed the longitudinal direction which consists of waterway space (91b) and waterway space (91d) is formed in parallel to the perfect waterway space which followed the longitudinal direction which consists of waterway space (91a) and waterway space (91c), and this waterway space. A waterway body (9) passes along such waterway space to a longitudinal direction, and comes to be allocated between each stage of a solar cell tile.

[0048] Since it is removable in a pendent plate part (35), post-installation and removal of a waterway body (9) can be performed easily. Of course, the pendent plate part (35) can constitute a connecting part (36) by the pendent plate part (34) of another side after the attachment, and can insert the connection standing board part (52) of a connecting tool (5).

[0049] It is an example when the waterway space (91e) (91f) which carried out the opening to the example of drawing 14 eaves side transverse-frame member (3) in part is provided. In this example, like the example of drawing 13, although the pendent plate part (35) of the eaves side transverse-frame member (3) serves as a removable segregant, waterway space is not established in this pendent plate part (35). The opening part is covered with attachment (for example, fixed with a fixing screw (8f)) of a pendent plate part (35), and waterway space (91e) (91f) turns into perfect waterway space by it.

[0050] Like the example of example of drawing 15 drawing 14, although waterway space (91g) (91h) is established in the eaves side transverse-frame member (3), in this example, the pendent plate part (35) does not serve as a removable segregant, and the removable cover body (96) of the different body is used. This cover body (96) has the waterway space (91i) (91j) corresponding to waterway space (91g) (91h).

The perfect waterway space by waterway space (91g) and waterway space (91i) and the perfect waterway space by waterway space (91h) and waterway space (91j) are formed by the attachment to the eaves side transverse-frame member (3).

[0051] In this example, the soaking plate (98) is formed in the back side of the photovoltaic cell (1) in order to raise more the efficiency of heating (warm-water-izing) of the warm water which flows through a waterway body (9). For example, with the photovoltaic cell (1), soaking plates (93), such as a product made from a steel plate, are attached in the attachment part (23) of each frame member (2), (3), (6), and (7), (33), (63), and (73), and are attached (also see drawing 20).

[0052] While the soaking plate (98) which has a wavelike portion is formed in the back side of the example of drawing 16 photovoltaic cell (1), it is an example in case the waterway body (9) is allocated along with the wavelike portion of the soaking plate (98). The soaking plate (98) serves as deep corrugated form prolonged in the longitudinal direction between the rear face of a photovoltaic cell (1), and the upper surface of a roof member (100), and, more specifically, the waterway body (9) is allocated by the gutter which carried out the opening in the direction of a photovoltaic cell (1) in the wavelike portion. In this allocation mode, since a waterway body (9) can be made to allocate densely not only at improvement in the warm water-ized efficiency by a soaking plate (98) but at a narrower interval, further improve efficiency can be realized.

[0053] As illustrated to drawing 15 and drawing 16, when a soaking plate (98) is used, For example, since there is a possibility that it may be easily filled with heat between a solar cell tile and a roof member (100), it is desirable to add the structure of making the flow of air and realizing ventilation as the white arrow in a figure showed. What is necessary is just to make the slit for ventilation, etc. form in the place which specifically serves as a way as air. The mode which provides a slit (it will be to the Cava object (96) if there is necessity in drawing 15) (not shown) in the regions of back of the connecting part (25) of the standing board part of fastener (4) (42) building side transverse-frame member (2) and the connection standing board part (52) of a connecting tool (5) in the example of drawing 15 and drawing 16 is possible.

[0054]For example, by above allocation of a waterway body (9) and use of a soaking plate (98), the solar heat hot water supply system illustrated to drawing 12 becomes realizable in a solar battery roof. First, on a roof, the waterway body (9) from sources (waterworks etc.) goes across the eaves side of the solar cell tile of an eaves side edge rightward [ left -> ], and as mentioned above leftward [ right -> ] between the solar cell tiles of the following stage located in the ridge side, it passes along waterway space (91a) - (91j) by the example of drawing 12. The waterway body (9) repeated this, and has run and plotted it on the roof. The waterway body (9) which has returned is connected to a flush tank (92). The gas boiler (931) of the hot water supply apparatus system (93) is connected to this flush tank (92).

[0055]The water from a source passes along the waterway body (9) allocated as mentioned above, is heated by solar heat, and turns into warm water. This heating (warm-water-izing) is effectively performed by flowing through the waterway body (9) which was run and was plotted on the roof. More effective heating is realized when the soaking plate (98) is installed.

[0056]The warm water from a roof is accumulated in a flush tank (92). The hot water supply apparatus system (93) is equipped with the controller (932) which measures the temperature data and preset temperature (for example, temperature required for utilization of hot water) from a temperature sensor (not shown) which measure the temperature of the warm water by solar heat, and controls warm water heating by a gas boiler (931). By control of this controller (932), if the warm water of the flush tank (92) has not reached preset temperature, it is heated by a gas boiler (931), it serves as preset temperature, and is used variously. The heating method of warm water is not restricted to a gas boiler (931), but, of course, publicly known various hot water heating means, such as heat pump (heat pump), can be used.

[0057]For example, with the solar heat hot water supply system of this above invention, also in the roof to which the solar energy power generation system was furnished, hot water supply of solar thermal conversion can be realized further, and exploitation of very effective solar energy can be aimed at now.

[0058]drawing 17 and drawing 18 are the key maps showing another example of this solar heat hot water supply system respectively. In the example of drawing 17, since the construction mode of the solar cell tile on a roof differs from drawing 12, it is an allocation mode of the waterway body (9) made to correspond to it. Other composition is the same as drawing 12. Although it is a construction mode of the same solar cell tile as drawing 17 in the example of drawing 18, After using the allocation mode of a waterway body (9) different furthermore and letting the waterway body (9) which passes a three-way-type valve (94) from a source pass to the ridge side edge, It is divided into two courses via a valve (95), passes along waterway space (91a) - (91j) by each interstage of a solar cell tile, respectively, it joins in an eaves side edge, and becomes one course again. And the waterway body (9) which has returned is connected to the gas boiler (931) of a hot water supply apparatus system (93) via a three-way-type valve (94).

[0059]The warm water which a flush tank (92) was not formed but was made from the example of drawing 18 at the time of the flow of the waterway body (9) on a roof is directly sent to a gas boiler (931), by control of a controller (932), when required, it is heated, and it is supplied to various utilization-of-hot-water means. Control of a three-way-type valve (94), a valve (95), and (adjusting the amount of warm water flows of waterway body (9) on a roof, etc.) is also possible for a controller (932).

[0060]Although the above drawing 12 - the example of drawing 18 are things when the waterway body (9) has run and surrounded the longitudinal direction on the roof, the mode which was run to the eaves ridge direction and with which it was surrounded as illustrated, for example to drawing 19 is also

possible.

[0061]In this case, it is necessary to let a waterway body (9) pass in an eaves ridge direction between the solar cell tiles which adjoin a longitudinal direction. Drawing 20 and drawing 21 are the waterway space structures in the left-hand side longitudinal frame member (6) and right-hand side longitudinal frame member (7) of a solar cell tile which made the allocation mode possible.

[0062]Waterway space (91k) (91l.) is established in the <example of drawing 20> left-hand side longitudinal frame member (6), and the right-hand side longitudinal frame member (7). In the left-hand side longitudinal frame member (6), the heavy flat part (64) serves as a removable segregant, and the waterway space (91 m) corresponding to waterway space (91k) (91l.) is established in the heavy flat part (64) used as this segregant. It is attached so that a heavy flat part (64) may cover the flat part (61) and (71) of a left-hand side longitudinal frame member (6) and a right-hand side longitudinal frame member (7), and the perfect waterway space which followed the eaves ridge direction which consists of waterway space (91k) (91l.) (91 m) is formed. A waterway body (9) is allocated in an eaves ridge direction through this waterway space. Of course, since it is removable in a heavy flat part (64), post-installation and removal of a waterway body (9) can be performed easily.

[0063]It is an example at the time of unlike the example of <example of drawing 21> drawing 20, not changing the left-hand side longitudinal frame member (6) in the above-mentioned Example 1, and the shape and structure of the right-hand side longitudinal frame member (7) itself, but using the removable cover body (97) of a different body. The cover body (97) has the waterway space (91n) which carried out the opening caudad.

It is attached so that the flat part (61) and heavy flat part (64) of a left-hand side longitudinal frame member (6) may be covered, and in that case, the opening part of waterway space (91n) is closed by the upper face part of a flat part (61), and perfect waterway space is formed.

[0064]A waterway body (9) passes along the waterway space which followed the eaves ridge direction with which the left-hand side longitudinal frame member (6) it was illustrated to drawing 20 or drawing 21 that mentioned above, and the right-hand side longitudinal frame member (7) were equipped by the solar heat hot water supply system of drawing 19, and is allocated in the eaves ridge direction in between each sequence of a solar cell tile with it. The waterway body (9) of the outward trip from sources (waterworks etc.) is opened for free passage in the ridge side edge on a roof with each waterway body (9) prolonged in the eaves ridge direction, and each waterway body (9) joins in an eaves side edge, it becomes one course and returns. The waterway body (9) which has returned is connected with the gas boiler (931) via the three-way-type valve (94).

[0065]Of course, the allocation mode of a waterway body (9), and the shape and the structure mode of each waterway space, It is not limited to what was illustrated to above-mentioned drawing 12 - drawing 21 until it says, and in the solar battery roof in which the solar cell tile of this invention was allocated, heating (warm-water-izing) by solar heat should just be an appropriately realizable mode. For example, in drawing 13 - the example of 15, waterway space (91a) - (91j) is formed so that parallel of two waterway bodies (9) may be attained simultaneously, but. A mode along which only one passes may be sufficient and it is also possible to equip either one of the eaves side transverse-frame member (3) or a fastener (4) with waterway space (91a) or waterway space (91b) in drawing 13 in this case, The waterway space (91c) (91d) of the pendent plate part (35) which is a segregant, of course is not

indispensable. For example, the mode etc. which combined the example (allocation which met the wavelike portion of the soaking plate (98)) of drawing 16, and the example (allocation through each waterway space) of drawing 13 - drawing 15 are possible. Conversely, in the example of drawing 20 and drawing 21, two waterway space may be provided so that the 2 concurrencies of a waterway body (9) may become possible.

[0066]Thus, this invention is not limited to the above example and still more various modes are possible for it about details.

[0067]

[Effect of the Invention] By this invention, attachment and removal of a solar cell tile can be performed easily in a short time, reduction of execution cost, etc. can be realized, and use promotion of a solar energy power generation system can be further aimed at as explained in detail above.

[0068]With a solar energy power generation system, a solar heat hot water supply system can also be furnished to the solar battery roof where the above-mentioned solar cell tile was constructed, sunlight use and solar thermal conversion can be simultaneously realized to it, and further effective use of solar energy can be aimed at now to it by this invention.

[Translation done.]

## CLAIMS

### [Claim(s)]

[Claim 1]The ridge side transverse-frame member with which a ridge side edge part and an eaves side edge part of a photovoltaic cell are equipped, and the eaves side transverse-frame member, And it has a connecting tool allocated between the eaves side transverse-frame member of a photovoltaic cell by the side of a fastener allocated on a roof member, and a ridge which adjoins an eaves ridge direction, and the ridge side transverse-frame member of a photovoltaic cell by the side of eaves, Engaging structure which can be engaged in a fastener and the ridge side transverse-frame member, and solar battery frame having the joining structure which can be connected enabling free separation via a connecting tool for the eaves side transverse-frame member and the ridge side transverse-frame member.

[Claim 2]Solar battery frame of claim 1 with which engaging structure can engage the ridge side transverse-frame member free [ vertically and rotationally moving ] to a fastener.

[Claim 3]Solar battery frame of claim 1 or 2 by which the ridge side transverse-frame member is equipped with a sluice part.

[Claim 4]It has a left-hand side longitudinal frame member and a right-hand side longitudinal frame member with which a left side end edge and a right side end edge of a photovoltaic cell are equipped, Solar battery frame a part of one left-hand side longitudinal frame members of a photovoltaic cell and parts of a right-hand side longitudinal frame member of another side which adjoin a longitudinal direction mutually overlapping, and having the waterproof construction which can prevent leakage of water.

[Claim 5]Solar battery frame of claim 4 by which a left-hand side longitudinal frame member and/or a right-hand side longitudinal frame member are equipped with a sluice part.

[Claim 6]Solar battery frame which consists of one solar battery frame of claims 1 thru/or 3, and solar battery frame of claim 4 or 5.

[Claim 7]Solar battery frame of claim 6 which forms a sluice which the sluice parts of a left-hand side longitudinal frame member and/or the sluice parts of a right-hand side longitudinal frame member which are mutually located in an eaves ridge direction which are mutually located in an eaves ridge direction adjoin, and continues.

[Claim 8]A solar cell tile provided with one solar battery frame of claims 1 thru/or 7.

[Claim 9]Are an execution method which lays a solar cell tile of claim 8 on a roof member, and a fastener is allocated in a prescribed position on a roof member, An execution method of a solar cell tile making the ridge side transverse-frame member of a solar cell tile by the side of eaves which adjoin an eaves ridge direction engage with this fastener, and making the eaves side transverse-frame member of a solar cell tile by the side of a ridge connect with this ridge side transverse-frame member via a connecting tool.

[Claim 10]A solar heat hot water supply system which is a solar heat hot water supply system used for a roof which constructed a solar cell tile of claim 8, and is characterized by allocating a warm water flow irrigation canal object on a roof through waterway space with which the eaves side transverse-frame member and/or a fastener were equipped.

[Claim 11]A solar heat hot water supply system which is a solar heat hot water supply system used for a roof which constructed a solar cell tile of claim 8, and is characterized by allocating a warm water flow irrigation canal object on a roof through waterway space with which a left-hand side longitudinal frame

member and/or a right-hand side longitudinal frame member were equipped.

[Claim 12]A solar heat hot water supply system of claim 10 or 11 with which the back side of a photovoltaic cell is equipped with a soaking plate.

[Claim 13]A solar heat hot water supply system, wherein it is a solar heat hot water supply system used for a roof which constructed a solar cell tile of claim 8, the back side of a photovoltaic cell is equipped with a soaking plate which has a wavelike portion and a warm water flow irrigation canal object is allocated along with a wavelike portion of a soaking plate.

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[Translation done.]